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# West Europe Report

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## WEST EUROPE REPORT

### SCIENCE AND TECHNOLOGY

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## ENERGY

### BALLAST COAL IN COMMERCIAL-SCALE FLUIDIZED BED

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German  
24 Feb 83 p. 7

[Text] The first commercial-scale installation for environmentally safe combustion of low-grade coal in a "circulating fluidized bed" according to a process of Lurgi Chemi-und Huettentechnik GmbH is located in the Lippewerk Leunen of the Vereinigte Aluminium Werke AG. It is part of a power plant which was designed for an output of 84 megawatts. The installation, which was also built by Lurgi, supplies an aluminum oxide factory with process heat and furnishes high pressure steam for the generation of electrical power.

A special heat exchanger in the fluidized bed heats a molten salt mass required as a high temperature heat transfer medium in a process step for the production of aluminum oxide. Separate oil- or gas-fired combustion chambers were previously required for this purpose. Only high grade, expensive coals could be used in the grate firing for steam generation. In contrast, the novel furnace system is operated with scrap coal, which can contain up to 65 percent ballast with no calorific value, and up to two percent sulfur.

With a consumption of over 99 percent, the ballast coal can be almost completely utilized. By limiting the combustion temperature to about 850 degrees Celsius and two-stage combustion in the fluidized bed, the formation of nitric oxides from components of the combustion air is kept extremely low. The formation of sulfur dioxides from the sulfur content of the coal and the atmospheric oxygen is kept to a minimum by the injection of fine-grain limestone into the fluidized bed, where the sulfur largely combines with the calcium to form calcium sulfate, which transfers to the ash. Even very low concentrations of limestone result in a desulfurization of up to 90 percent. Since the dust content is also very low due to this process, there is no need for an additional stack gas scrubber.

Thus fluidized bed firing offers the basic prerequisites for making power plants "clean" and the energy they provide cheaper than was ever able to be obtained from fossil fuels. In addition to its production task, the installation in Leunen is presently used for additional research activities as well, the main purpose of which is a systematic investigation of the various fuels as to their suitability for the process, the pollutant emissions still remaining and possibilities for utilization of resulting ash.

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CSO: 3698/225

## ENERGY

### BRIEFS

COAL FLUID PIPELINE STUDIES--Coarse-grain coal with a grain size up to 6 millimeters can also be transported in a pipeline over long distances. The Salzgitter-Konzern has come to this conclusion after intensive studies with the test installation in Haverlahwiese, a district of Salzgitter. However, the company wants to continue these tests with new units in order to be able to investigate the hydraulic behavior of highly concentrated coal-fluid mixtures as well. In this connection, the attempt would be made to design a system which would be able to transport coal-water mixtures composed of 70 to 80 percent solids. The flow properties of such a mixture, even with grain sizes smaller than 0.1 mm, would already be similar to oil. The mixture could thus be fired even in this transportable state. The company expects the first usable results next year. Transportation of coal by pipeline could have the advantage that the customary expensive "transshipment" from one means of transport to another would be entirely eliminated. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 23 Feb 83 p 5] 12347

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## INDUSTRIAL TECHNOLOGY

### SSAB EMPLOYS ONE OF WORLD'S MOST MODERN STEEL PROCESSES

Stockholm NY TEKNIK in Swedish 2 Dec 82 pp 18-19

[Article by Anders Sundberg]

[Text] The SSAB [Swedish Steel Corporation] in Oxelosund uses an improved steel process that provides better carbon combustion. The result is that better steel quality is achieved in the steel furnace itself--and expensive subsequent treatment to further improve the steel's quality is avoided.

Since June of last year, one of the world's most modern steel processes--the LBE process\*--has been in use by the SSAB's Metallurgical Division in Oxelosund.

The special feature of the new process is that gas is blown through the charge from below.

The result is better carbon combustion and considerably higher steel quality from the start. No expensive subsequent treatment is needed.

#### Porous "Blast Stones"

A complete modernization of metallurgy in Oxelosund was carried out as far back as the late 1970's.

The basis of the system introduced at that time was a furnace of the LD type.\*

That furnace can produce 145 tons of steel at one time, with about a quarter of an hour being required to complete the process.

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\* The SSAB in Oxelosund produces commercial steel, primarily plate.

"LBE" stands for Lance-Bubbling-Equilibrium, a process developed by the Arbed steel concern in cooperation with the French research institute IRSID [Institute of Siderurgical Research].

The LD furnace got its name from the two Austrian steel mills in Lintz and Donawitz where the process was developed.

The process requires 125 tons of crude iron, 30 tons of scrap, 6 tons of lime for forming slag, and the 7,000 cubic meters of oxygen gas needed to keep the steel process going.

Rikard Kallstrom, who is a researcher at the steel mill, says:

"Describing it briefly, the new LBE process works like this:

"The inside of an LD furnace is lined with brick. Twelve of the furnace's bottom stones are replaced with porous so-called blast stones, whose chief characteristic is that they can allow gas to pass through. During the process, the gas blows through the charge and the slag."

Rikard Kallstrom continues: "This means that the steel we produce has a lower carbon content and therefore greater strength."

He says: "Normally, we use the inert gases nitrogen or argon.

"Achieving a low carbon content in the furnace itself reduces production costs, since we quite simply do not need expensive subsequent treatment."

Claes Sandgren, production manager at the SSAB's Metallurgical Division in Oxelosund, says: "We got our first information about the LBE process in 1980.

"A year later we decided to convert our LD furnaces to the new system, and we have been in full production with that system since last June."

He continues: "Our experience to date has been good. The quality of the steel has improved, and at the same time, production costs have dropped.

"We will recover our investment costs within a year."

Oxelosund is currently the only steel mill in Sweden that uses the LBE process.

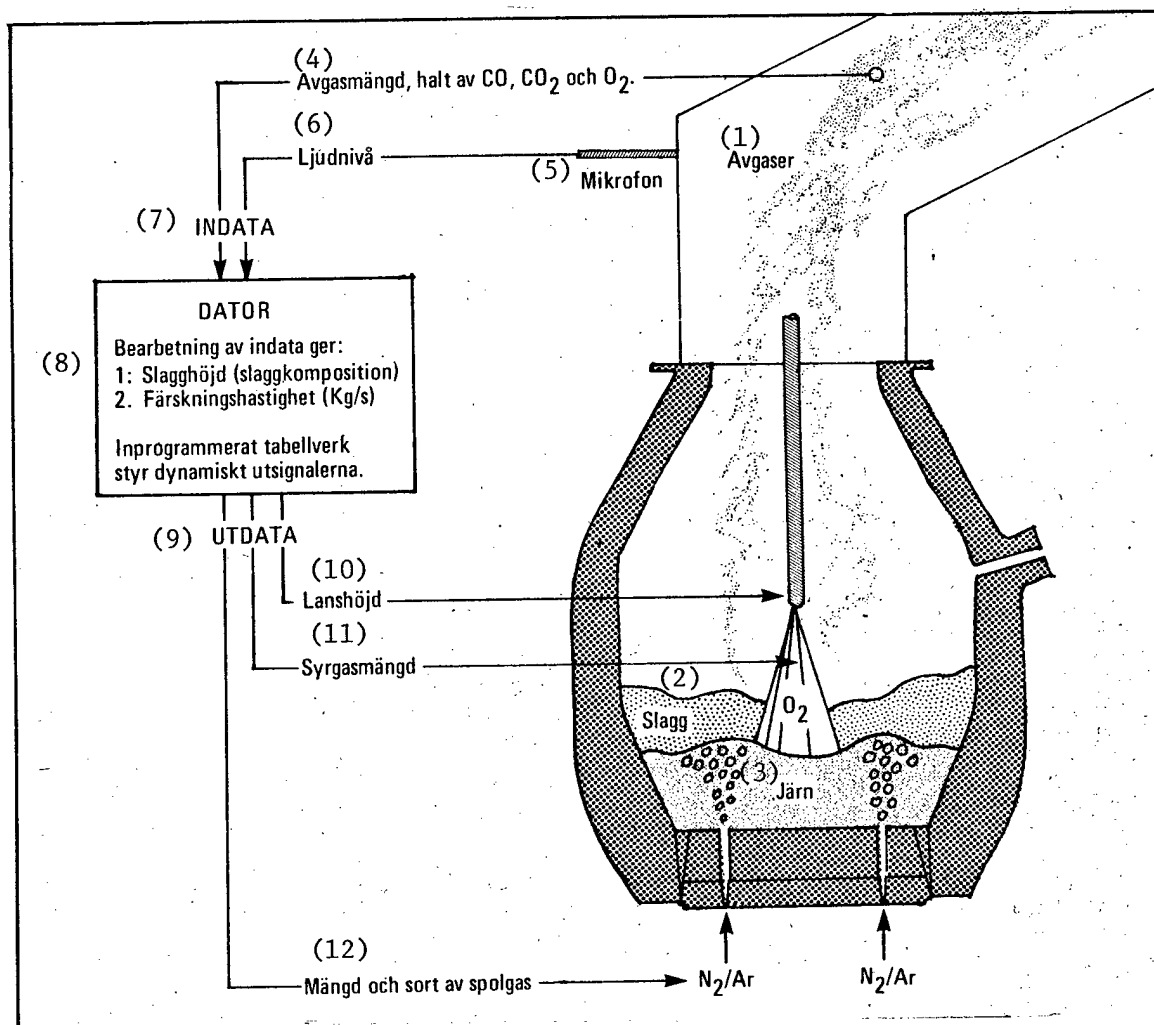
Claes Sandgren claims: "This means that Oxelosund can now compete with producers of commercial steel anywhere in the world."

#### Low Carbon Content

According to Rikard Kallstrom, the advantages of the LBE process are primarily these:

1. The carbon content of the steel, which is, of course, what determines its strength, can be made very low in the furnace itself. Expensive subsequent treatment is avoided.
2. The oxygen content of the steel is reduced. That produces a more slag-free steel and reduces the consumption of alloying materials--primarily aluminum and manganese. In a normal steel process, considerably higher quantities of alloying materials are used, and that becomes expensive in the long run.





Oxelosund's LBE converter, with a skeleton diagram showing how the process control system developed by Arbed and the IRSID works with dynamic computer control.

Key:

1. Exhaust gases
2. Slag
3. Iron
4. Quantity of exhaust gases (content in CO, CO<sub>2</sub>, and O<sub>2</sub>)
5. Microphone
6. Sound level
7. Input

8. Computer:
  - Processing of input reveals:
    1. Height of slag (slag composition)
    2. Cooling rate (kg/s)
  - Output signals are controlled dynamically using programmed statistical data
9. Output
10. Height of lance
11. Quantity of oxygen gas
12. Quantity and type of blast gas

3. For its part, the slag has a lower iron content and a greater ability to remove sulfur and phosphorus from the bath.

4. That in turn yields a higher iron content and a lower content of phosphorus and sulfur in the steel. Moreover, less lime is required, since lime is added to the charge so that the slag will absorb more carbon and oxygen.

There are also a few technical refinements in the LBE system:

The blast of gas through the charge is so intense that the height of the slag can be regulated. This is important because the greater the area of contact between the slag and the charge of iron, the more carbon and oxygen can be burned and the better the steel that is produced.

Rikard Kallstrom says: "For that purpose, we have installed a microphone so that we can tell from the sound how high the slag is in the furnace. If the slag goes too high, we simply cut back a little on the oxygen feed."

Kallstrom adds: "In addition, we have designed a special slag barrier that prevents the slag from mixing with the steel when the latter is removed from the furnace.

"That prevents expensive subsequent purification."

The entire process can already be controlled by computer, but the plant in Oxelosund does not want to go that far yet. It is a matter of maintaining the level of job proficiency and interest among the employees.

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## INDUSTRIAL TECHNOLOGY

### RESEARCH MINISTRY FUNDS FACTORY-AUTOMATION PILOT PROJECTS

Duesseldorf WIRTSCHAFTSWOCHE in German 25 Feb 83 pp 52, 53, 55, 56

[Article: "Small-Lot Manufacturing Control: Future Undergoing Pilot Test"]

[Text] The integration of factory data acquisition and the control of manufacturing with the computer, until now the domain of the giants, is penetrating more and more into the one-of-a-kind and small-lot manufacturing companies. Two small machine builders are already accumulating experience.

The days of improvising in manufacturing control, not seldom extolled as medium-sized flexibility, appear now to be numbered also in small industrial operations. Improvising produces bad results: A delivery date is set based on experience and a rule of thumb: meeting the deadline requires the feverish fire-drill activity of all hands; upon refiguring, troublesome overruns of estimates crop up without one knowing exactly where costs got out of control; after a machine type has been modified to customer desires, it is discovered that a machine meeting these specifications was on the shelf. Surprises such as these can no longer be tolerated even in a 200-man operation.

A solution to these problems will be made possible by computer-controlled, integrated factory control systems fully packaged with microelectronics which until now have been the domain of mass-production operations such as automobile factories and oil refineries.

For two small machine-building companies in the southern part of Germany, the future has already begun. They are gathering experience--within the scope of two pilot projects supported by the Federal Research Ministry--with linking design terminals and CNC machines, commercial EDP and text processing to produce a comprehensive but adaptable planning and control system. Located in Hamlar, Bavaria, Grenzbach Machine Building GmbH, which produces customized conveying and painting facilities for the automobile, plate glass and wood working industries, has actually begun marketing its Orgam System, a "modular, transportable organizational structure for one-of-a-kind machine builders." In south Baden at Grenzach-Wyhlen, Translift Company for Lifting and Conveying Facilities mbH, also a medium-sized firm, is introducing its PSK (Planning-Guidance-Control) System.

In contrast to large-scale manufacturing, with its infinitely repeatable and thus easier to standardize processes, which approaches manufacturing control via the computer, corresponding experience is lacking for the production of smaller lots. Due to the lack of suitable models, businessman Rudolf Grenzbach decided to take the development "into his own hands."

As his operation moved toward the 200-man threshold, Grenzbach and his managers were simultaneously coming up against the limits of their management capabilities: "Up to 120 to 130 employees, one can still manage most things individually in specialty machine building; beyond this number of employees it is no longer possible." He faced the choice of either "reducing the size of the company, since the computer would not pay for itself, or expanding to 300 employees."

He decided in favor of the second alternative and looked around in other companies for suitable manufacturing control systems. But none satisfied his concept: "There were outstanding models for work breakdown or for the distribution area, but no satisfactory schedule control and not all solutions were compatible." From the Association of German Machine and Facility Builders (VDMA), he learned that there was no existing system for one-of-a-kind machine builders.

Indeed, the idea was so new that the Bonn research support agency turned down Grenzbach's first project proposal. Also a second attempt failed since the responsible agency had been dissolved. Only after a third attempt was the tenacious Bavarian successful: the ministry allocated DM 1 million, half of the planned development cost. "In the intervening period, 30 similar proposals were submitted: We got there first."

The Orgam System is, according to Grenzbach, "a total concept," which goes from marketing, through distribution control up to computing. The focal point is the coordination of manufacturing, starting with design and continuing through procurement control, material flow control and schedule control. "With it we place greater responsibility on the individual," says Grenzbach in explaining the intention. "Better goals are placed before them, and at the same time they are given the instruments to make task accomplishment easier."

To be sure, benevolence is not behind this nor is motivational psychology, just solid economic calculations. "The information process," explains Rudolf Grenzbach, "is the only important functional area within which the individual manufacturer can significantly economize. All other areas, for example actual production work, have relatively modest potential for economizing due to the small number of units and the high requirements on quality."

Studies by medium-sized machine builders, which, like Grenzbach or Translift, concentrate on single-unit and small-lot manufacturing to order, have discovered something which remains hidden in the thicket of conventional cost accounting: The cost of the information process for planning and execution

in these companies reaches or exceeds the combined cost of materials and manufacturing wages.

How important, on the other hand, timely, exact information is becomes clear from the Orgam Intermediate Report: "already in the functional definition, configuration definition and detailing phases" of a special machine "about 80 percent of the contract costs become fixed." That means conversely, that the contractor is forced to make binding price and schedule commitments at a point in time when the manufacturing sequence and cost structure are not yet accurately known.

Orgam and PSK attempt to close these information gaps through the use of EDP and organizational measures. The central item for both systems is a company-wide data bank. There, both the historical and current manufacturing status data are stored. The individual departments--contract planning, material utilization, facilities planning, work-breakdown, computing, design and sales --can access the data bank with the aid of freely combineable program modules.

Electronic factory data acquisition at the scene of the action, for example at an NC machine, replaces the paper tracking method and accelerates feedback, a previous weak link in factory reporting. Disruptions in contract execution can thus be recognized and corrected earlier; an accompanying calculation which helps to prevent cost derailments is available. Greater standardization of parts and also manufacturing processes which are common to the various machines and facilities variants will make proposal preparation and manufacturing set-ups more reliable.

Graduate Economist Manfred Heiler of Translift thus expects from the company's own PSK System an array of improvements: reduction of procurement costs, better material availability and utilization, more accurate scheduling, lower capital utilization through faster product turnover, maintenance of liquidity and damming the paper flood.

In spite of such solid goals which can be expressed in quantities, minutes, Marks and pennies, PSK, like Orgam, is supposed to be more than a complicated clock work consisting of computer hardware and software parts in which employees are nothing but cogs. Integrated control is not supposed to mean that rigid work routines throttle flexibility.

"It is a matter," formulates Rudolf Grenzbach, "of creating a control system which monitors progress toward the goal, but leaves up to the individual how he solves the problems--that is best known by the people in production or sales themselves. With Orgam, he adds, "we have to be able to work even when the EDP facility (a DM 400,000 IBM 38 to which 36 CRTs can be connected) for whatever reason does not run. When for example a customer on Saturday afternoon urgently needs a spare part for 20 marks and it has to be taken out of stock, we have to be able to make such transactions."

Even less than the manufacturing control system itself--if it actually is to function--is its development and introduction a purely technical matter determinable in detail ahead of time. The new procedures change the overall

factory operation too greatly for a company to simply adopt a prefabricated concept or one tailored by outside specialists.

"The strategy of procuring from the outside to an appreciable degree technical, business and organizational solutions inherently conceals longterm dangers," in the opinion of an expert, the director of data processing at the Rendsburg Energy supplier Schleswig AG, Miklos Hoffmann. This way a sensitive part of business management is relinquished, management will all too easily degenerate into formalisms. The hope that external know-how will be successively passed on to the workers is not always realistic.

On the other hand, if a company like Grenzbach were to be overcharged, it would do the project itself as an act of will. The EDP programs are thus being developed by the PSI Company for Process Control and Information Systems in Berlin, and the computation and marketing concept by Dr Vieweg and Partner Business Consultants GmbH. The Institute for Applied Organizational Research (IFA0) in Karlsruhe, an offshoot of the university, is involved with work structures. An employee questionnaire provided information concerning organizational weak points like issuance of tools, material provisioning and additional modifications to machinery. Two scientists from the University of Trier have been considering new requirements in the personnel area.

The teams from outside work closely with each other and with the Grenzbach employees, and without the latter's involvement and familiarity with the real procedures, it would not be possible to finish the project in the allotted time. "The entire crew," praises the company chief, "is pulling together, even the shop committee. Every single job will be illuminated. The people are ready to question every procedure." In this, the material-flow know-how from transportation technology is especially helpful.

Even though important preparatory work such as the acquisition and documentation--each with 3 key numbers--of the almost 20,000 parts has already been accomplished, the project will not be completed until the beginning of 1985. The first programs have been implemented. "Sometimes the additional work, which often lasts into the evening, is a drag," groans an especially involved employee. "But there is no getting around manufacturing control."

#### CNC Machines Upgrade Jobs

The use of CNC machines, or machine tools with freely programmable controls, is not tantamount to a "post industrial" future in which automats take over the work of humans and leave them only the vexing information work. Rather the opposite is true as is shown by a comparative German-British study of the Berlin Science Center concerning CNC machine applications\*. All too

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\*Arndt Sorge, Gert Hartmann, Malcolm Warner, Ian Nicholas: "Microelectronics and Work in Industry: Experiences From the Application of CNC Machines in Great Britain and the Federal Republic of Germany." Campus Press, Frankfurt 1982. 181 pages, DM 34.

readily scenarios are developed which are based solely on technical progress and which neglect the socioeconomic framework in which technology itself evolves. With this in mind, the workerless, fully-automatic factory is to be conceived as the product of the expansion of markets for homogeneous mass-produced goods or a longterm stable demand for specialized products.

On the other hand, another market is more and more crystallizing out which is characterized by variation and dynamic change. For this, standardized production solutions would prove to be too expensive and complex since the manufacturing process would be in a state of continuous change or correction. An appropriate production-technology answer is flexible manufacturing with CNC controls.

Also, company size and organizational structure exert decisive influences on the way CNC machines are used. Two extremes are clearly evident:

--The machine programming is accomplished outside of the shop by specially trained rigger programmers. The turning and boring machine operators remain on station but exercise a simple monitoring function for a larger number of machines than in the conventional manufacturing system. This form of organization would fit the popular notion of automation. Actually, the development is increasingly running toward the other extreme.

--Relieving the machine operator of his mechanical activities makes it possible to involve him in planning and programming. This change in function does not necessarily come as a result of the objective of humanizing the work place, rather it stems from solid economic reasons.

Aside from the fact that productivity is generally higher in Germany, it turned out in the country comparison between Great Britain and the FRG that higher productivity always exists where industrial branches are founded on skilled workers and managers.

CNC machines are not displacing the skilled worker from his historical role but are ushering in a renaissance of the concept of skilled labor through the wider distribution of responsibility in the shop.

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CSO: 3698/249

## SCIENCE POLICY

### FRG RESEARCH MINISTER DESCRIBES R&D POLICY

Duesseldorf WIRTSCHAFTSWOCHE in German 11 Feb 83 pp 24, 26

[Interview with Heinz Riesenhuber, Federal Research Minister, date and place not specified]

[Text] /React Quickly to Market Impulses/

People are talking about the research in institutes and industrial laboratories. In a conversation with WIRTSCHAFTSWOCHE, Federal Research Minister Heinz Riesenhuber describes the possibilities of returning West German research to the top.

[Question] Mr Minister, are we still doing enough research?

Riesenhuber: We are in a good position internationally both from the point of view of the number of people engaged in research and the proportion of the gross national product allocated to research. This holds true both for basic research and for industrial research.

[Question] But still the complaint is heard from one end of the country to the other that we're falling farther and farther behind.

Riesenhuber: The research capabilities in industry have been stagnating for practically ten years. But during the same period, what people here call defensive research--for example the guarding and circumventing of patents or the fulfillment of government directives for environmental protection or safety--has risen substantially. But because the total outlays for research have actually remained the same, the proportion of creative research has dropped.

[Question] Then has at least the small amount still remaining for that portion which has significance for the future been properly used in industry?

Riesenhuber: Government assistance in industrial research was certainly financially helpful in essential areas, but structurally it was perhaps more a hindrance. Since the government reserved the final word in the selection of projects with direct project support, which of course comprises the major portion of industrial support, market forces were excluded. With his request for support, the entrepreneur doesn't gear himself toward that which the market demands, but



that which is worthy of support. But precisely with small and medium-sized companies it is a matter of reacting quickly to market impulses and changing demand. For that reason, direct project support is problematic for these companies.

[Question] In other words, you want to return to stronger indirect support?

Riesenhuber: There is a wide range of various indirect means of support beyond traditional tax relief. The personal cost allowances which reside with the Federal Minister of Economics are one concept, joint research of the AIF [Industrial Research Associations Work Group] and the support of outside contract research through the BMFT [Federal Ministry for Research and Technology] is another. While we were still in the opposition, we wanted to open up a third possibility with our request to continue the 4.35 billion mark program for support of measures for conserving heating energy. We wanted to concentrate this program on new energy technologies. This support is not intended to start with the producer, but with the purchaser of new techniques--tax-wise possibly with benefits as well--so that the market makes the project selection.

/"Because the outlays for research have actually remained the same, the proportion of creative research dropped."/

[Question] Are there other examples of indirect support aside from slicing up the tax cake?

Riesenhuber: One example is the special program "Application of Microelectronics." Here we are providing indirect specific support. The support is limited to the highly innovative area of microelectronics, but the government leaves the choice of projects up to the entrepreneurs themselves. Another idea which I am investigating comes from the United States. The Reagan Administration rewards research capacities which have been additionally produced above the average of the past three years, with a tax bonus. This is enticing: it's indirect since it supports no specific topic. It's oriented to the future because it improves a company's research capacities. And for us it would have a third, especially interesting aspect: it can assist in creating professional opportunities for the large number of young scientists who will be coming along in the coming years.

[Question] For that you would have to create mobility in the personnel structure of the government research organizations.

Riesenhuber: Yes, only one percent of the scientists in large research organizations transfers to industry each year. We have no circle of small and medium-sized companies around the large organizations, as is the case in the USA, founded or directed by former colleagues of these institutes. It would be fine with me if someone leaves a large research organization and takes his own project with him--in a borderline case "steals" it. The main thing is that the available knowledge is being put to use. Nothing is worse than knowledge that isn't converted.

[Question] How do you intend to generate more mobility among our scientists?

Riesenhuber: I could picture for example, that the offer be made to researchers to hold their position open for a few years if they want to enter the economy for a specific time or form their own company.

[Question] The establishment of technology-oriented companies seems to be a focal point of your support policy.

Risenhuber: For me the establishment of enterprises is an indispensable element of a timely policy of technology and innovation. We will present a support model for establishing such enterprises at the Hanover Fair. In its first phase, consultation, among other things for questions of business, will be emphasized. The second phase is concerned with converting the idea into prototypes. In this phase the government would also become financially involved up to 75 percent. The third phase is then concerned with the procurement of capital for production and marketing. When necessary, the government would provide guarantees to make this search for capital easier. The goal of this model experiment of the BMFT, which has time limits and has been discussed with the states and economics [ministry] is to improve the opportunities for new technology firms and to test the support tools. After that the decision will be made with all parties concerned, whether and in what way a broad introduction into practice can be made.

/"There is a wide range of indirect means of support beyond traditional tax relief."/

[Question] The Federal Minister of Finance would also have something to say in your plans for more indirect research and technology support.

Riesenhuber: For political reasons I would prefer any tax solution to a bonus regulation. For the Minister of Finance, who thinks the same as I do politically, a tax solution would be much more difficult to afford budget-wise than a bonus. To that extent it is entirely likely that we'll have to revert to the second best device.

[Question] To what extent are you inclined toward such measures in the 1984 budget, which you are currently preparing?

Riesenhuber: In the 1983 budget with direct project support, which is earmarked for about two billion marks, we have cut down about 20 percent. We intend to submit about the same in the next budget. At the same time, there are project areas where we don't reduce direct support: very large projects, for example, steel research, space research. However, I believe that within the previously prevailing medium-term financial planning we will have between 100 and 200 million marks available. This amount could be used to reinforce indirect support. At the same time, the question of whether and to what extent the research budget increases, has not been finalized.

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## SCIENCE POLICY

### LUND RESEARCH PARK: FIRST DIRECT UNIVERSITY-INDUSTRY RESEARCH

Stockholm DAGENS NYHETER in Swedish 10 Feb 83 p 9

[Article by Bo Engzell, of DAGENS NYHETER's Scania office]

[Text] Lund, Wednesday [9 Feb]--Several thousand new jobs in high-technology Swedish industries such as electronics and chemistry and in the food technology field will be created by a research park, quite unique for Sweden, that will be built in Lund. The first 1,000 new jobs are already assured, it was revealed Wednesday.

When completed the research park will cost several hundred million kronor. The government is announcing at the same time that 34 million kronor is being granted for expansion of the Chemistry Center at the University of Lund.

In the research park at Lund the first direct cooperation between researchers at the universities and college-level institutes on the one hand and industry on the other will now be introduced to get new high-technology industrial products.

The new products will then result in "offshoot industries." Not only in Scania, but in other parts of the country, too. But Scania, of course, holds the trumps.

"It is time to create a new garb for Scanian industry," said District Governor Nils Hörjel, who heads up the cooperation between university and industry (SUN) that has started in Lund.

Hörjel has worked hard for SUN, and as one of the impelling forces he will be given an honorary doctorate by the University of Lund.

6,300 Employees

The first firm is already prepared to move into the research park as soon as it is built.

The newly formed Ericsson Radio Systems, a part of the L.M. Ericsson concern, showed up on Wednesday. The new firm represents a merger of SRA [Swedish Radio Company] Communications, Ericsson's defense and space electronics division, and Ericsson's military telecommunications division; it employs a total of 6,300, with the emphasis on Kista.

"Ericsson Radio Systems has a good influx of orders," says the managing director of the new company, Åke Lundqvist of SRA.

The new firm will now go after the electronics market hard, with exports to the United States and Japan, etc.

The first product that will be taken up in the research park in Lund is a system of wireless mobile telephones intended in part for the export market.

#### Giant Market

"We estimate that in the United States alone there is a market for the mobile system amounting to 20 billion Swedish kronor, says Director Lundqvist. "Later we shall start up many new projects in Lund. Hundreds of technicians will be needed, together with administrative personnel. In a decade there will be a thousand or so in Lund.

"I believe in the idea of a new development milieu for Swedish industry that Lund represents. Sweden can get on the right side of the balance of trade by investing in advanced technology."

Big industrial countries have research centers in connection with universities and institutes. Now Sweden will follow.

"It is research-intensive industry that will be tomorrow's tune," says Prof Nils Stjernquist, rector of the University of Lund. "In Lund we have also invested a great deal in computer technology in the university and in industrial electronics directed toward mechatronics. Direct contact between researcher and industry will be something of a motive force for both parties."

#### Chemistry Center

Governor Hörjel reveals that another 10 firms or so are knocking at the door of the research park, where the firms will have to rent. The research park is being built directly adjacent to the university and the big pharmaceutical and sanitation firms Draco and Gamro.

The research park will extend over 100,000 m<sup>2</sup>. The first stage of construction will cost 100 million kronor. It will be followed by two similar stages.

The chemistry center in Lund, which the government is spending 34 million kronor to expand, is already the biggest research center of its kind in northern Europe. Work is being done there and will be intensified in the food technology industry, which can also furnish many new jobs.

"This is the first time the government has made a decision that is directly aimed at making it possible for industry to locate a part of its activity in a university area," says Secretary of State Erland Ringberg, of the Ministry of Education.

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## SCIENCE POLICY

### ANALYSIS OF FRENCH INDUSTRIAL POLICY UNDER SOCIALISTS

Paris LE NOUVEL ECONOMISTE in French 10 Jan 83 pp 34-39

[Article by Jacques Barraux: "Which Industrial Policy?"]

[Text] Mechanics, chemicals, electronics will be the three test sectors of French industrial socialism in 1983.

After the incantation, the trial by experience. For a long time, the left had proclaimed its determination to reindustrialize France. A quarter of a century ago, in a coalition with the Christian-democrats, the socialists invented the Common Market, thus triggering the most dramatic rejuvenation course of the production apparatus since Napoleon III. Allied to the communists in 1981, they massively expanded the scope of the producer-state and gave a free hand to a new generation of Saint-Simonians stemming from the main public bodies. Was it the best answer to the structural difficulties of the French industry? The policy of Mr Jean-Pierre Chevenement, 44, minister of Research and Industry, is about to be subjected to a credibility test.

From the automobile to office automation, from fine chemicals to materials, from the agribusiness to telecommunications, the chips are not yet down on the major world markets. But multinationals react to crises faster than states. Of the 50 leading firms on the planet--21 of which are American, 7 German and 5 Japanese--only 4 showed losses in 1981 (they included Renault and Peugeot...). Drastic remedies have shaken the structures of giants that were growing sluggish, like General Motors, Ford, DuPont de Nemours and Siemens. At a time when French giants that could be nationalized were taking a break (from the spring of 1981 to the spring of 1982), all world industry leaders were accelerating their decision-making process. The continued recession and the successes of the Japanese industry accounted for their haste.

The most striking example is probably that of IBM (30 billion dollars in sales), which has just reorganized to adapt its structures to prospects in the office automation and telecommunications market. To its tradition of internal growth, the world leader in electronics has now superimposed a policy of alliances in the fields of components (it has acquired an interest in Intel, the inventor of the microprocessor), private networks (agreement with Mitel) and robots (with Sankyo).

A similar commotion is taking place at ATT which is about to expand outside the United States and jostle the world telephone industry. In Europe, too, the giants are bustling about. In Eindhoven, Philips's new boss, Mr Wisse Dekker, has opened negotiations on several fronts: research agreement with Siemens, negotiations with ATT, open line with CIT-Alcatel, pending transactions with Thomson, etc.

All over the world, joint ventures are becoming popular. But the phenomenon worth following is probably the appearance of a tacit coalition between the two major powers in the Pacific: the United States and Japan. Showing a certain genius for pragmatism, U.S. and Japanese manufacturers are signing a multitude of punctual agreements. True, the Europeans are no less intent on throwing bridges over to Tokyo, but relations between the United States and Japan are infinitely denser. In the bioindustry, the U.S. Biogen is working with Teijin. In process control, General Electric and Itoh intend to join forces. IBM wishes to cooperate in the MITI [Ministry of International Trade and Industry] program to develop a fifth computer generation and is negotiating a microcomputer agreement with Matsushita. General Motors is doing business with Toyota and is still holding stock in Isuzu and Suzuki. Ford owns 25 percent of Toyo Kogyo (Mazda). Whether restricted or global, old or new, all these agreements will affect the future aspect of growth markets. They also place Western Europe in an increasingly excentric position with respect to the new center of gravity of business life.

What can European--and therefore French--manufacturers do in the face of the irresistible thrust of the Pacific zone? Should they too expand their alliances with Japan? To do so, they would have to be in a position to negotiate on an equal footing; otherwise, they will find themselves confined to the role of subcontractors (the British industry provides a not very glorious example of that). Should they form inter-European coalitions? This, of course, is the solution recommended in Brussels by Mr Etienne Davignon, commissioner to industrial affairs. His long experience of community affairs has deprived him of all illusions. From steel quotas to reductions in chemical textile plant capacities, his missions until now have been mainly restricted to rescue operations. However, he explains: "Something is changing in mentalities. In 1982, for the first time, Europe affirmed its identity at the GATT negotiations in Geneva and in its relations with Japan. Member countries have become aware of the systematic failure of all attempted bilateral agreements with Tokyo." And the European commissioner offers three subjects of reflection on industrial policy.

"In the three-way game, EEC-United States-Japan," he explains, "Europe as it is now can only be on the defensive. We must first tell ourselves that the geopolitical weight of the 260 millions of Europeans is decreasing each year. The Ten will find it increasingly harder to retain their share (33 percent) of world trade. It has already dropped to 15 percent in data-processing technologies." As it turns out, the automobile remains the major strong point of Europe. It has giants like Renault, which do not hesitate to launch an industrial offensive in the heart of the United States (Mr Bernard Hanon, Renault Chief Executive Officer, is staking his career on the U.S. deal).

Second argument: "Europe cannot do everything, and until now even the Japanese have not tried to do everything. However, Mr Davignon goes on, "we must not accept to stay out of strategic sectors. By that, I mean growth activities that could lead to spin-offs in other peripheral markets, upstream or downstream. Electronic components and consumer electronics are typical examples of strategic activities. The EEC can still catch up in these fields. If it became necessary, we could consider protection measures to assist in implementing community programs."

Third idea: the Europe of the Ten is wasting its financing resources. "Contrary to a widespread idea, the sums mobilized by MITI to initiate its major programs are not larger than those available to European enterprises. On the average, we spend about twice as much as Japan in research and development. Yet, Japan produces five times as many patents as the EEC! I cannot think of a better proof of the suicidal consequences of scattering our efforts."

According to Mr Davignon, one of the mistakes of industrial policy makers in member countries has been to sacrifice everything to a policy of "champions." The computer industry, he says, is significant: preferential public purchasing contracts and maximum aid went to ICL [expansion unknown] in Great-Britain, to Siemens in Germany and to CII-Honeywell Bull in France. As a result, no European manufacturer ranks among the eight leading world manufacturers. "The champion policy leads to the sterilization of the sector involved. All the vitamins are given to a company that prospers. There is nothing left for the freelance who create new markets." Seven years ago, Messrs Steven Jobs and Stephen Wozniak had not yet introduced the Apple. And who would have said only five years ago that Digital Equipment would become world number two in computers, ahead of Control Data, NCR and Burroughs?

The multinationals are more aggressive than ever, the European mosaic is ready to fall apart, a succession of dramatic events has taken place on the new technological markets: how does France manage across this new turbulence zone?

Seen from the outside, the French industry is neither weaker nor stronger than it was before 10 May 1981. France has remained in the middle of the group of seven nations which "make the law" in the business world. Admittedly, it is dominated by the United States, Japan, the Soviet Union and the FRG. But, like Great-Britain and Italy, it cannot be ignored by international headquarters.

At the November 1982 Symposium on Industrial Policy, Mr Chevenement complacently displayed the "damning" results of the 1974-1981 government management. "Another 10 years, and France would have been finished!" And he explained that disindustrialization was the result of a "serious error in analysis." Giscard's and Barre's supporters, he claimed, had taken a short aim when they adopted a policy of "niches," that left "steel to Korea or Brazil, textiles to Hong Kong, and electronics to Japan. France was acknowledged to be a small country and had to be content with finding its--modest--place in the international division of labor."

Of course, Mr Andre Giraud, minister of industry until May 1981, claims he is shocked by this cutting assessment. He is irritated by the constant reference that is made to the concept of [production] "line," which he finds excessively vague. He, too, he says, dreamt of a large industrial project for France. Just as, under Pompidou, the adviser team headed by Mr Bernard Esambert saw in accelerated industrialization the only way to achieve Mr Jacques Chaban-Delmas's "new society."

The postwar economic history is punctuated with such appeals to industrial voluntarism. From the start of the Fourth Republic--and as a counterpart for the Marshall plan--France accepted to sign the GATT agreement and to become a member of the OECD. What was involved at the time was renouncing the protectionist laws of the Third Republic and outlawing anti-competition market-sharing practices (omnipresent professional unions, systematic creation of sectorial cartels). Although it was poorly understood at first by nationalistic leaders such as Pierre Mendes-France and Charles de Gaulle, the Common Market had a surprisingly healthy effect on the industrial fabric. New "middle weights" took off: Bongrain, Legrand, Moulinex, Cap-Gemini-Sogeti. They caught up with well-established companies: L'Air Liquide, Michelin, Lafarge and L'Oreal. France was not afraid of plunging into unprotected markets. Enterprises at last opened themselves to the new methods of management (the first business administration institute appeared at the university in 1957). The distribution sector started its revolution. By the late 1960's, France seemed to have overcome for good the demons of xenophobia and economic obscurantism.

At the same time, the state--faithful to an ancient tradition of planned economy--was developing a strategy of large projects. In the nuclear sector, it took over the whole industrial chain, from the ore to the reprocessing of spent fuel. In aeronautics, there was the Airbus European cooperation program, and the CFM-56 with General Electric. In the space sector, the Ariane project. Thus, France's industrial policy developed around two opposite poles, one liberal (Community free trade), the other marked by state intervention (large programs sponsored by public organizations like the DGT [expansion unknown] and the CEA [Atomic Energy Commission]).

But the French miracle was interrupted by the first oil crisis in 1973-1974. Mr Chevenement can indeed speak of the ensuing uninterrupted industrial decline (the industry lost 680,000 jobs between 1975 and 1981). Yet, until the second oil crisis in 1979, it looked as if things could still get better. The "champions" appointed under Pompidou (Rhône-Poulenc, Thomson, CGE [expansion unknown], PUK [Pechiney-Ugine-Kuhlmann], and Saint-Gobain) did not give the impression of having made the wrong strategic decisions. When restrictions on industrial prices were lifted in 1978, the operating results of enterprises improved. The semi-nationalization of the steel industry, the launching of the "components plan," the "telephone" remedial plan, the creation of CODIS [Company for the Development of Strategic Industry]: no one can deny that efforts were made in the 1970's to revive industrial growth. At the Ministry of Finance, the Treasury Directorate, through CIASI [expansion unknown], was attempting to save from bankruptcy the first giants that were weakened by the crisis (Boussac, Terrin, Manufrance, Neogravure, European Cellulose Group, United French Tanneries, ARCT [expansion unknown], etc.) Today, CIASI has become CIRI (Interministerial Committee for Industrial



Restructuring). The same departments are busy with the same cases. Paper manufacturing at La Chapelle-Darblay, textile machinery at ARCT, and what remains of Manufrance still have to be saved. The self-confidence of business executives discouraged by the continued recession and the deterioration of operating results (cost of the fifth vacation week, the 39-hour week, Social Security and UNEDIC [expansion unknown]) must be restored. Finally, the new machinery of the employer-state--which now controls 30 percent of the whole industry, 50 percent of all enterprises with a personnel of over 2,000 and 75 percent of the total research and development potential--must be broken in.

Following the example of the chief of state and Mr Pierre Mauroy, Mr Chevenement has drawn up a long list of his industrial policy priorities. He would like to see the industry attract 100 billion francs in investments in 1983, not just 60 billion. He would like to see basic industries adopt a "plan logic" and processing industries a "market logic." He would like to see the research programming and orientation law have immediate effects on the life of enterprises. He would like to see the nationalized sector become at last a pacemaker for investments, technology and social innovation.

The socialists, who started with the idea they would reconquer everything, are coming back to traditional schemes of selective intervention. They started with the conviction that the nationalized sector alone could ensure recovery, but they are now trying to do something for all enterprises, whether small or large, private or public. And they find themselves forced, reluctantly, to devote the largest part of state means to nationalized companies. We already know that Mr Chevenement will not balance his 1983 budget. Far from being in a position to organize an industrial counterattack, most national enterprises run the risk of being paralyzed by the lack of capital: reported losses amount to 8 billion francs for EDF [French Electric Power Company], 3.5 billion for GDF [French Gas Company], 5 billion for SNCF [French National Railroads], close to 7 billion for Usinor and Sacilor, close to 3 billion for PUK, 1.3 billion for CII-Honeywell Bull, 1.3 billion for the French Coal Board, etc. Once the deficits have been made up, how much will there remain for new operations?

Actually, the minister of industry plays a dual role. On the one hand, he is the minister of all French enterprises. On the other hand, he is in charge of nationalized enterprises. No matter how much autonomy is given to chief executive officers in the public sector, the problems of this sector are so extensive that recourse to the ministry's services is unavoidable. This is why the opinion that a new tentative distribution of tasks is taking place within the government is--rightly or wrongly--gaining credence in industrial circles. For many heads of small and medium-size enterprises in the private sector, their minister is the minister of economy rather than the minister of industry.

Yet, after 24 months of managing industrial affairs, the departments headed by Mr Pierre Dreyfus first, then by Mr Chevenement, cannot be said to have confined themselves to the problem of nationalized companies alone. They have dealt extensively with some 10 sectorial dossiers involving the private as well as the public sector. In doing so, they have attempted to implement

an assistance program for the textile/clothing industry. They have completed a courageous rationalization program of the Sacilor and Usinor plants. They have gathered the shipbuilding yards around two poles (the North-Mediterranean Shipbuilding Yards on the one hand, and the West Shipbuilding Yards controlled by CGE on the other hand). They have engineered the recovery of the Boussac-Saint-Freres group in cooperation with IDI (Industrial Development Institute). Finally, they have undertaken a complete reconstruction of three major sectors: machine-tools-robots, chemicals and electronics. These will be the three tests of socialist knowhow.

The "machine-tools" test. Of all sectorial measures adopted since the left came into power, the "machine-tools plan" is probably the one that was approached and implemented in the best manner. It was started in the fall of 1981 by Mr Pierre Dreyfus, after an exhaustive inventory of enterprises operating in this sector had been made. Then, DIMME (Directorate of Metallurgical, Mechanical and Electrical Industries, headed by Mr Pierre Gadonneix) and the Treasury, assisted by consultants, identified the two or three companies enjoying the best position in each subsector: machining centers, numerical control, special machines, machine-tool components. Negotiations were then carried out with the enterprises involved, after a public aid "master agreement" extending over several years had been prepared in cooperation with the Machine-Tool Syndicate.

Preparation of the plan in cooperation with enterprises, signature of separate agreements, information of professional and union organizations, broadening of the financing sources (through IDI and major equipment-purchasing groups): the procedure followed was exemplary. We must hope that it will serve as an example to all future sectorial policies.

The machine-tool geography thus finds itself entirely renewed. Some 30 companies employing 10,000 workers (55 percent of the personnel employed in this sector) are covered by the plan, under which two major federating poles are acting as pilots. On the one hand, large milling-machines and lathes, with the French Heavy Machines Company (MFL), which is headed by Mr Louis Tardy, 58, IDI's man (IDI being the largest shareholder of MFL). On the other hand, the "catalog" machines with the General Machine-Tool Company (CGMO), headed by Mr Jean-Thomas Mandula and controlled by the Suez and CIT-Alcatel groups.

The collapse of the world market did not make the start of the French program easy. And the total number of jobs in this sector is expected to decline. But, with an investment of 2.5 billion francs plus 2.5 billion francs in subsidized loans, the authorities are giving a chance to the leading firms in the sector. In the long run, the machine-tool plan will be one component in the "productics plan" to be announced in a few weeks (productics includes all industries relying on process-controllers or robots, as well as handling equipment and machine-tools). The Chevenement team made a courageous decision: they decided to drop Dufour, guilty of wilfully sabotaging a rescue program. The Dufour personnel and the communist municipality of Montreuil were systematicall preventing Vernier from assuming control of the plant. As a result, the Dufour plant will close down.

The "chemical industry" test. It was to be expected: the nationalization of all the French chemical industry giants created the largest "Tinkertoy" assembly of plants and companies that was ever seen in France (even including the steel industry). It all began in the fertilizer industry, when the sector was divided into two groups. On one side CDF[French Coal Board]-Chemicals with its Nitrogen and Chemicals subsidiary and a company taken over from Rhone-Poulenc, Gesa. On the other side, Cofaz (controlled by Paribas) which inherited another Rhone-Poulenc subsidiary, Sopag.

Second occasion for another important division: the redistribution of the assets of PCUK [Pechiney Chemicals-Ugine-Kuhlmann], the chemical subsidiary of Pechiney, which Mr Georges Besse, PUK chief executive officer, was only too happy to get rid of. The objective of the operation was to launch four state-owned chemical groups. The four leaders bitterly fought over choice pieces of PCUK assets: Elf-Aquitaine (specialized in basic chemicals with Ato and Chloe) obtained certain fine chemicals operations of PCUK; Rhone-Poulenc inherited Pharmuka and the inorganic chemicals operations of PCUK; CDF-Chemicals strengthened its organic chemicals and plastics operations and took over Lorilleux-LeFranc, a major printing ink company; and the Mining and Chemical Enterprise EMC got the Loos plant. When all restructuring is completed, Elf-Aquitaine (which is scheduled to purchase CFP's [expansion unknown] interest in Ato and Chloe) will become the leading French chemical group, with assets worth 36 billion francs (Rhone-Poulenc ranking second). This is an overwhelming responsibility for Mr Rene Sautier who was appointed president of the branch and will have to carry out a comprehensive restructuring program.

Under the chemical industry plan, which is arbitrated by Mr Chevenement, assets have been distributed. But no hierarchy of operations has been established. Is it to remain faithful to the idea of production line? The debt of PCUK, the massive losses of CDF-Chemicals and the "misfirings" of the Elf-Aquitaine machinery (which was weakened by the refining industry crisis and Texas Gulf's difficulties) will sooner or later force the state to reduce the number of its chemical operations. Mr Loik Le Floch-Prigent, chief executive officer of Rhone-Poulenc, seems to be the one who is doing best. The group had a strategy. It is sticking to it.

The "electronics line" test. It has been said over and over again: electronics must be the grand design of this presidency. To the surprise of the professionals, the Council of Ministers announced on 28 July 1982 the launching of a five-year 140-billion-franc program.

How was this figure arrived at? The departments of Mr Jean-Claude Hirel at DIELI [Directorate of Electronics and Computer Industries] (the specialized directorate at the Ministry of Industry) and Mr Jacques Dondoux at the PTT [Postal, Telecommunications and Television Administration] (Mr Dondoux is heading the General Directorate of Telecommunications) were to explain later on that this was only an "estimate" based on Mr Abel Farnoux's report (on research, production, marketing and training in the electronics industry).

Since then, the overall approach seems to have been replaced by a more traditional sectorial approach. The "components" plan was revised and the number of poles reduced from two to three: Thomson and MATRA [Mechanics, Aviation and Traction Company] (while Eurotechnique was leaving Saint-Gobain's orbit to join Thomson). CGE and CII-Honeywell Bull became competitors in office automation. The CII-Honeywell Bull computer operations were increased with assets from CGE and Thomson. A cabling plan was introduced by the PTT (1.4 million telephone subscribers by 1985). Still in the telephone sector, a large debate was started between the ministry of industry and the PTT concerning the advisability of creating some sort of "French Telephone Company" (that would start with joint research by CGE and Thomson on next generation equipment). The fate of the nationalized CGCT [expansion unknown] plants still remains to be decided.

The chief executive officers involved, Mr Georges Pebereau for CIT-Alcatel and Mr Alain Gomez for Thomson, are careful not to disclose their plans on all these matters. Should disagreements arise between the ministries that give orders and those that purchase equipment, the chief executive officers would probably have to negotiate territorial amendments between themselves.

The reason why socialist officials have chosen electronics as a testing ground for their new industrial policy have finally become clear. By nationalizing Thomson, CGE, MATRA and CII-Honeywell Bull, they have given full control to the state. On markets in full growth, it is still possible to create from scratch. This is a singular challenge which presumes a rigorous control over projects. Cutting through organization charts will not be enough to give cohesion to the new public multinationals.

Mr Alain Gomez, Thomson chief executive officer and the man who is now taking the largest risks for the future (he must both put his group back on its feet and secure a position for it on the world market) is the first one to be convinced of that.

In short, the success of the socialist experiment will not depend so much on Socialist Party militants, elected officials or even ministers as on the handful of proconsuls--some socialist, other liberal--whom the government has chosen to head the nationalized conglomerates. It will depend still far more on whether the state knows how to keep at a distance from the public sector while renewing its dialogue with enterprises as a whole. This appears to be the main line of Mr Mitterrand's new policy.

#### Thomson's Kriegspiel

The Europe of electronics cannot be made without Philips, which ranks fourth in the world after IBM, General Electric and ITT. The fact that the group is entrenched in EEC countries gives credibility to the declarations of principles of its leaders. Some time ago, there was its Unidata attempt

in the field of computers with Siemens and CII (France having withdrawn in 1975). Yesterday, there were its negotiations with CIT-Alcatel concerning an agreement in the field of telephone (this time again, France lost interest). Today, Philips is mobilizing against Japan on the front of consumer electronics.

Who stands opposite Philips? The English--whom the concept of European industrial integration leaves indifferent--have abandoned the consumer electronics leadership to the Japanese. In the FRG, Siemens and Bosch-Blaupunkt are reluctant to make an all-out commitment to consumer products. Alone, the French company Thomson appears to be showing a clear determination. It has taken over three medium-size FRG companies: Nordmende, Saba and Dual. It is the second European producer of color TV tubes after Philips. And it is tackling a large company: the Grundig group (30,000 jobs, 9 billion francs in sales, compared with 12 billion or so for Thomson's consumer electronics). The new Thomson-Grundig group--assuming the FRG does not oppose the deal--should therefore represent some 22 billion francs in consumer electronics, compared with 42 billion for Philips.

A minority shareholder (24.5 percent) of Grundig, the Dutch giant is now taken on by Thomson. This is a good opportunity to test European goodwills: to prepare the second generation of videotape recorders, based on a new universal standard (8 mm); to arrive at agreements on components and new consumer products, etc.

There is no lack of thorns. Philips intends to do all it can to increase the sales of its V-200 videotape recorder (which would then be manufactured by Thomson via Grundig, although Thomson is also importing the JVC-Matsushita system). The fate of the AEG-Telefunken consumer products division has not been clearly decided (in theory, it would be taken over by Grundig). And, across the Rhine, some would like to see the creation of a Philips-Siemens-Bosch axis.

Mr Alain Gomez is playing for high stakes. Less than one year after his appointment, he has toned up Thomson's executive staff. Will he be able to convince Philips?

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## TRANSPORTATION

### SAAB AUTOMATES ENGINE BLOCK FOUNDRY

Stockholm NY TEKNIK in Swedish 2 Dec 82 p 22

[Article by Goran Lundstrom]

[Text] Sweden is one of Europe's biggest consumers of castings. But at the same time, Swedish foundries are losing out increasingly to foreign competitors.

The reason, according to a report by the Industrial Board, is that most Swedish foundries have not kept pace with technical developments.

But there are exceptions. Saab-Scania in Sodertalje has been investing heavily in new technology and increasing its capacity: 40 million kronor are being invested in the foundry over a 5-year period.

Saab-Scania's foundry in Sodertalje specializes in engine blocks and cylinder heads for truck and passenger car engines.

A new line for the production of large sand casting molds recently went into operation, and a large German-made hydraulic molding machine--the largest in Europe--is now stamping out a sand casting mold every 4 minutes.

Within a year, when the other parts of the foundry have also been automated, full production capacity will mean a 30-percent increase in the number of cast parts in comparison with today.

When the decision was made in 1979 to invest in the foundry, the situation was different than it is today: 1979 and 1980 were record years in the heavy truck industry. World production totaled approximately 500,000 trucks per year. Of that number, Saab-Scania produced about 26,676 units, and Volvo produced about the same. Moreover, large sectors of the foundry industry were depressed, and the working environment was not the best.

The fact that Saab-Scania's truck sales are now dropping by 8 percent per year (world production is down by a full 20 percent) has not brought about a change in the 1979 investment decision. There is still a lot of optimism. When completed, the foundry will have an annual capacity of 16,000 tons of castings, the equivalent of about 43,000 engines.

In the foundry process, molds are made, the molten metal is poured into the molds, and the casting is shaken out after it cools. The newest thing in the foundry process is the method of making the molds.

Compressed air is used to blow sand into the new hydraulic machine for big sand molds. Hydraulic cylinders compact the sand against a pattern having the same shape as the part being cast.

Two sand impressions together produce the cavity into which the molten metal is poured. The principle is therefore the same as that for casting tin soldiers. It takes about 1 minute to produce each mold.

Using the previous sand molding machine involved slinging the sand against the pattern in a procedure that took from three to four times as long to complete.

The new machine and the conveyor lines for finished molds are monitored by 500 different sensors that check for position, stresses, level, and temperature. All the signals are processed by a control computer.

Powerful suction devices keep excess sand and dust away from the work floor. The patterns, made of steel, are inserted into the sand molding machine automatically. Two patterns are needed for a complete sand mold. Since there is room for four patterns around the machine, two different kinds of mold can be produced simultaneously.

Before the half molds are locked together in preparation for pouring the molten steel, the cores are placed in the molds.

They produce the cavities in the completed casting. The cores are also made of compacted sand. They are placed in the molds by hand using various tools.

With the new machine, a complete mold can be produced every minute. But because of manual pouring and a limited cooling track, only one mold can be produced every 4 minutes. Within a year, even the pouring will be automated.

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## TRANSPORTATION

### SAAB'S NEW AUTOMOBILE ENGINE SAVES GASOLINE

Stockholm DAGENS NYHETER in Swedish 3 Mar 83 p 32

[Article by Göran Ström]

[Text] Saab's new turboengine will have 16 valves and 2 overhead camshafts. The size of the engine is unchanged, but the power will be increased to the neighborhood of 160-180 DIN hp. In spite of the fact that more power will be developed, the gasoline consumption will not rise, but will decrease by about 1 deciliter per mile.

The new engine will be exhibited next week at the automobile exhibition at Geneva. The engine will be shown free-standing and not mounted in an automobile. Saab wishes to indicate in that way that it is not yet ripe for mass production.

The Saab 900 Turbo may get its new engine by the 1984 model year at the earliest, but that is not yet certain. It may take longer.

With the new design Saab hopes to be able to attain both higher power and lower fuel consumption. The size of the motor is unchanged; like the earlier one it has four cylinders and a total cylinder volume of 2.0 liters.

Saab's present turboengine gets 145 DIN hp [i.e., horsepower as calculated under the German Industrial Standard]. The new engine will have a top power in the 160-180 DIN hp range; exact figures are not available.

#### Less Gasoline

In spite of the great increase in power, the gasoline consumption will not rise in the new design, but instead will decrease by about 1 deciliter per [Swedish] mile.

Such a development is entirely possible. Other automobile manufacturers have succeeded by various methods in getting increased power without increasing the fuel consumption of their motors.

Gasoline engines in passenger cars for everyday use ordinarily have one intake valve and one exhaust valve per cylinder. The valves are controlled by a camshaft, which nowadays is often above the cylinder head (overhead camshaft).



Saab's new engine's having four valves per cylinder and two overhead camshafts is not entirely unique. Similar equipment has long been used for motors adapted for racing by many manufacturers, including Saab.

The new thing about it is that a system that has previously been connected with special cars is now to be used in standard production--albeit on a luxury model.

It is rather the rule than the exception that automobile manufacturers introduce important technical innovations on their highest-priced models and later--to the extent that prices permit--extend them to cheaper models.

There are thus good grounds for assuming that Saab plans in the long run to use 16 valves for four-cylinder engines other than turbos.

The new model with 16 valves is understood to be at least as reliable and wear-resistant as Saab's current turboengine and require no more servicing.

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